

NON-PUBLIC?: N
ACCESSION #: 9004040165
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Palo Verde Unit 2 PAGE: 1 OF 7

DOCKET NUMBER: 05000529

TITLE: Manual Reactor Trip During Planned Shutdown
EVENT DATE: 02/23/90 LER #: 90-001-00 REPORT DATE: 03/26/90

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 024

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Thomas R. Bradish (Acting) Compliance Manager

TELEPHONE: (609) 393-2521

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At approximately 2301 MST on February 23, 1990, Palo Verde Unit 2 was in Mode 1 (Power Operation) at approximately 24 percent power during a planned shutdown for a refueling outage when the reactor was manually tripped by a reactor operator because the Axial Shape Index was approaching its trip setpoint on the Core Protection Calculator. The reactor trip was diagnosed as an uncomplicated reactor trip. No other safety system responses occurred and none were required. At approximately 2311 MST on February 23, 1990, the plant was stabilized in Mode 3 (Hot Standby) at normal temperature and pressure.

The cause of the manual reactor trip was that the Axial Shape Index was approaching its trip setpoint during an end of core life shutdown. The corrective action was to trip the reactor and ensure the Axial Shape Index remained within limits.

A previous similar event was reported in LER 528/87-018-01.

END OF ABSTRACT

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I. DESCRIPTION OF WHAT OCCURRED:

A. Initial Conditions:

At approximately 2301 MST on February 23, 1990, Palo Verde Unit 2 was in Mode 1 (Power Operation) at approximately 24 percent power during a planned shutdown for refueling.

B. Reportable Event Description (Including Dates and Approximate Times of Major Occurrences):

Event Classification: Any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF)(JE), including the Reactor Protection System (RPS)(JC).

At approximately 2301 MST on February 23, 1990, while shutting down for a planned refueling outage, the Unit 2 reactor (RCT)(AC) was manually tripped by a reactor operator (utility, licensed) due to the Axial Shape Index approaching its trip setpoint on the Core Protection Calculator (CPU)(JC). The reactor trip was diagnosed as an uncomplicated reactor trip. No safety system responses occurred and none were required. At approximately 2311 MST on February 23, 1990, the plant was stabilized in Mode 3 (Hot Standby) at normal temperature and pressure.

The Axial Shape Index is defined as "the power generated in the lower half of the core less the power generated in the upper half of the core divided by the sum of these powers" (Technical Specification Definition 1.2). Axial Shape Index is calculated in each of the four Core Protection Calculator Channels. When a Core Protection Calculator Channel calculates an Axial Shape Index greater than .50 or less than minus .50, it generates a trip signal to the Plant Protection System (JC). The Plant Protection System has a two-out-of-four logic thus requiring Axial Shape Index trip signals from two Core Protection Calculator Channels to initiate a reactor trip.

Prior to the event, at approximately 1700 MST on February 23, 1990, Unit 2 was at approximately 97 percent power when boration was started to shutdown the reactor for the scheduled refueling outage. During the reactor shutdown, Axial Shape Index increased in the negative direction. The Group 4, Group 5, and Part Length Control Element Assemblies (CEAs)(ROD)(AA) were inserted in

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accordance with an approved procedure to dampen the negative shift in Axial Shape Index. During the CEA insertion, Axial Shape Index initially became less negative, but then the trend continued in the negative direction. At approximately 2023 MST, insertion of Group 4 CEAs was stopped in accordance with an approved procedure due to indication of a potential ground. Manipulation of the Group and Part Length CEAs continued to optimize Axial Shape Index control.

At approximately 2130 MST with the reactor at approximately 40 percent power and decreasing due to increasing Xenon concentration, a maximum dilution (120 gpm) was started to slow the power decrease and stabilize Axial Shape Index. At approximately 2149 MST, with Axial Shape Index approaching the limit (minus .28) of Technical Specification 3.2.7.a, the Group 4 CEAs insertion was continued in accordance with an approved procedure. No grounds were detected during this insertion.

At approximately 2218 MST on February 23, 1990, the Axial Shape Index decreased below the limit (minus .28) of Technical Specification Limiting Condition for Operation 3.2.7.a and the associated ACTION statement was entered. The Group 4, Group 5, and Part Length CEAs were again manipulated in accordance with an approved procedure in an attempt to control Axial Shape Index without success. The Reactor Engineer (utility, non-licensed) and Control Room Shift Supervisor (utility, licensed) discussed the situation and determined that any further power reduction would increase the negative shift in Axial Shape Index. At approximately 2256 MST, the Shift Supervisor and Operations Supervisor (utility, licensed) were discussing the potential for Axial Shape Index approaching the trip setpoint on the Core Protection Calculator. At this time the Channel D Core Protection Calculator generated a trip signal to the Plant Protection System based on Axial Shape

Index exceeding its trip setpoint (minus 0.50). The Shift Supervisor and Operations Supervisor decided to manually trip the reactor if any of the untripped Core Protection Calculator channels Axial Shape Index reached minus 0.49.

Axial Shape Index continued to approach the trip setpoint for the Core Protection Calculators non-tripped channels and at approximately 2301 MST on February 23, 1990, the reactor was manually tripped when Channels A and B Core Protection Calculators Axial Shape Index reached minus 0.49. The reactor trip was uncomplicated and at approximately 2311 MST on February 23, 1990, the plant was stabilized in Mode 3 at normal temperature and

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pressure. There were no Engineered Safety Features responses or actuations and none were necessary.

C. Status of structures, systems, or components that were inoperable at the start of the event that contributed to the event:

Not applicable - no structures, systems or components were inoperable which contributed to this event. The Group 4 CEAs were not inoperable. Their use was restricted based on past experience and justification for continued operation.

D. Cause of each component or system failure, if known:

Not applicable - no component or system failures were involved.

E. Failure mode, mechanism, and effect of each failed component, if known:

Not applicable - no component failures were involved.

F. For failures of components with multiple functions, list of systems or secondary functions that were also affected:

Not applicable - no component failures were involved.

G. For failures that rendered a train of a safety system inoperable, estimated time elapsed from the discovery of the failure until the train was returned to service:

Not applicable - there were no failures that rendered a train of a safety system inoperable.

H. Method of discovery of each component or system failure or procedural error:

Not applicable - there were no component or system failures or procedural errors.

I. Cause of Event:

The cause of the manual reactor trip was that the Axial Shape Index was approaching its limits during an end of core life shutdown (SALP cause code X). Past industry experience shows it is difficult to maintain operating limits, especially Axial Shape Index, during an end of core life shutdown, particularly with

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large (height) cores. The shutdown plan, based on an evaluation of core parameters during a normal shutdown, predicted Axial Shape Index would approach its limit at the end of the shutdown. As described in Section I.B, the shutdown plan did not maintain Axial Shape Index within its limits. There were no personnel errors or procedural errors that contributed to this event. There were no unusual characteristics of the work location that contributed to the event.

The restriction to movement of Group 4 CEAs from approximately 2023 MST to approximately 2149 MST due to the indicated ground as described in Section I.B, may have contributed to the event. However, due to operator actions to control Axial Shape Index as a result of the restriction on movement of Group 4 CEAs, the exact effect cannot be accurately determined. The CEA grounding problem had been identified prior to this event. Justification for continued operation had previously been prepared. A procedure had been approved for CEA operation when there are indicated grounds on CEAs.

J. Safety System Response:

A manual reactor trip occurred due to the Axial Shape Index approaching its trip setpoints on the Core Protection Calculators as described in Section I.B. No other safety

systems responses occurred and none were required during this event.

K. Failed Component Information:

Not applicable - no failed components were involved.

II. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THIS EVENT:

The reactor trip was manually initiated prior to the reactor exceeding a Core Protection Calculator trip setpoint and was diagnosed as an uncomplicated reactor trip. No safety systems response was required. The event did not result in any challenges to fission product barriers or result in any releases of radioactive materials. Therefore, there were no safety consequences or implications as a result of this event. This event did not adversely affect the health and safety of the public.

III. CORRECTIVE ACTIONS:

A. Immediate:

The reactor was manually tripped to ensure the Axial Shape Index Core Protection Channel trip setpoint was not exceeded.

B. Action to Prevent Recurrence:

1. Because of the reactor core physical characteristics there is a potential for a reactor trip during an end of core life shutdown. However, APS is enhancing the procedures listed below to reduce the chance of a reactor trip during a planned shutdown.

a. Procedure 4XOP-XZZ05 "Power Operation", is being enhanced to include a requirement to obtain Reactor Engineering's prediction of important parameters prior to starting a shutdown (when time permits). This requirement is expected to be implemented by October 31, 1990.

B. Procedure 72PR-9ZZ01 "Reactor Engineering Program", is being enhanced to provide more formal control of the information provided to Operations by Reactor Engineering. This is expected to be implemented by

October 31, 1990.

2. The Unit 2 Control Element Drive Mechanism coils are being inspected and re-worked during the current refueling outage to correct CEA grounding indications.

IV. PREVIOUS SIMILAR EVENTS:

LER 528/87-018-01 described an event where the reactor tripped during an end of core life shutdown. The reactor was shutting down to evaluate a possible Reactor Coolant System leak. The reactor trip was automatically initiated when the Core Protection Calculator generated a trip signal to the Plant Protection System due to Axial Shape Index exceeding limits. The root cause of the event was a deficient procedure. The procedure did not contain sufficient strategies for controlling Axial Shape Index at the end of core life. The procedure was updated to include strategies for controlling Axial Shape Index during an end of core life shutdown. Although these were similar events, the corrective action could not have prevented the event

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described in this report, even though strategies for controlling Axial Shape Index were used in accordance with the approved procedure.

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Arizona Public Service Company
PALO VERDE NUCLEAR GENERATING STATION
P.O. BOX 52034 PHOENIX, ARIZONA 85072-2034

JAMES M. LEVINE 192-00640-JML/TRB/RKR
VICE PRESIDENT March 26, 1990
NUCLEAR PRODUCTION

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC
0555

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 2
Docket No. STN 50-529 (License No. NPF-51)

Licensee Event Report 90-001-00
File: 90-020-404

Attached please find Licensee Event Report (LER) No. 90-001-00 prepared and submitted pursuant to 10CFR50.73. In accordance with 10CFR50.73(d), we are herewith forwarding a copy of the LER to the Regional Administrator of the Region V office.

If you have any questions, please contact T.R. Bradish, (Acting) Compliance Manager at (602) 393-2521.

Very truly yours,

JML/TRB/RKR/tlg

Attachment

cc: W. F. Conway (all with attachment)
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*** END OF DOCUMENT ***
